

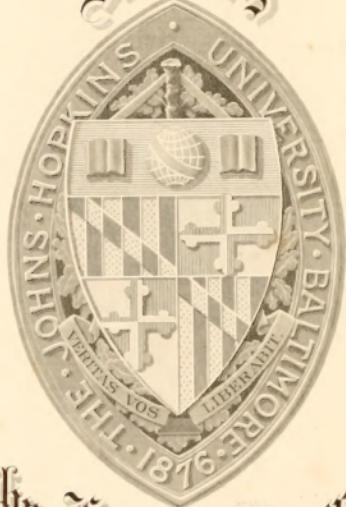
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The Johns Hopkins University
1876



Some Double Chlorides of Ferric and
of Ferrous Iron with Some
Aromatic Bases.

Dissertation.

Submitted to the Board of University Studies
of the Johns Hopkins University
for the Degree of
Doctor of Philosophy

by

Raphael Monroe McKenzie

1896.

Conc.

1. - 2. -

Solubilities of iron previously described.

Properties.

Testing of extracts of analysis; iron, chlorine, total
stomach weight used in this work.

Oxidation of the organic bases by ferric
chloride.

Preparation of the salts for analysis and the
results of the analyses.

Conclusion.

Conclusion.

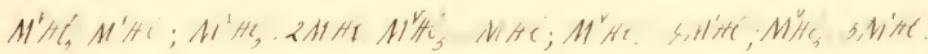
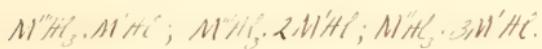
Acknowledgment.

This investigation was undertaken at the suggestion of Professor Remsen and was carried out under his direction. I wish to acknowledge here my indebtedness to him for suggestions in the course of the work and for encouragement in times of trouble. I wish also to thank Professor Grove and Dr. Jones for instruction in the

Introduction.

The subject of double halides was discussed in an article by Professor Remsen in 1888, in which he noted that the double halides were related to each other in the views previously held in regard to them. He showed that almost all the double halides mentioned in the literature - in all over four hundred - could be arranged in a few simple series which might be represented by the following types:

$M^x\text{H}_2\text{X}_2$; $M^x\text{H}_2\cdot 2M^y\text{H}_2\text{X}_2$.



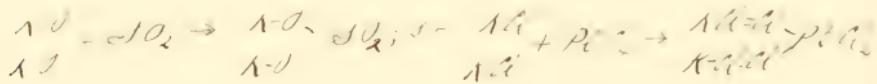
In these types M^x represents any polyvalent metal and M^y any alkali metal.

From this study the generalization was drawn that, "When a halide of any element combined with a halide or an alkali metal to form a double salt, a ratio of molality of 1 to 1 was observed."

are added to one molecule of the other halide, is never greater and is generally less than the number of halogen atoms combined in the latter? So the halogen atoms are combined as, however, there, "two halogen atoms together can play the same part that the so-called linking oxygen atom plays in the oxygen salts"; thus the double halides were secured from the more weak di-molecular compounds and given a place among the atomic compounds, and this is reflected in the platinumate, K_2PtCl_6 , which under the old views were considered as molecular compounds of two atoms of platinum and six atoms of chlorine or platinum chloride. Thus, $2KCl \cdot PtCl_6$, we now consider as salts of definite chloroacids, as the hydrochloroplatinic acid, H_2PtCl_6 .

Just as acidic oxides react with basic oxides to form salts, so will the two di-molecular basic halides to form double halides. This sim-

ilarity between the oxychlorates and the iodides indicates the same from the following formulae:-



A thorough investigation of those compounds given in the literature, which did not fall under this law, was undertaken by studying those under Troxler's Bureau. The work was also carried further in order to obtain all the iodides of the metals under investigation, that could possibly be found under existing conditions. In the course of this study some iodide halides were discovered that did not fall under the law. Therefore an extension of the law was made to include these and some other salts, as AlCl_3I_2 and CdHgHgCl , which had long been known. Some other iodide halides of cadmium and zinc have since been brought out by Weiss and Eder¹ and by Weiss and Lachman².

¹ Amer. Chem. Soc. Trans. 14, 85-87; ² Amer. Acad. Sci. Proc. 1889, 15; ³ Phil.

for which we have the same reasoning.
In the oxidation of the Cu^{+} , the halogen atoms
can act together to form a bridged group, $\text{Cl}-\text{Cl}^{\cdot}$. Then the salt has the composition
white, $\text{CuO}_2 \cdot 2\text{KCl}$ and represented thus
 $\text{Cu}-\text{Cl}^{\cdot}-\text{Cl}-\text{K}$.

It appears from the work of Sandell¹ that
double halides do not form new halides of metals
belonging to the same valence group.

The work on the ion Cu^{+} halides has been extended
into the field of organic chemistry by the use
of the substituted ammonia of the aromatic series
in place of ammonia. Such double halides of
tin, mercury, antimony, zinc and aluminum
have been studied in this laboratory. It is
evident at present that it will be difficult
that this investigation pertains.

Double halides of iron having division.
 A search of the literature up to the Fall of
 1894, was made to find what double halides of
 iron had been & inorganic and/or organic bases
 had been prepared. No double halides of iron
 with bases of the organic bases had been prepared
 and those with the halides of the metals had
 not been thoroughly investigated.

$2KCl \cdot FeCl_3 \cdot 2H_2O$	Trüb. d. phys. chem. Ber.
$2NH_4Cl \cdot FeCl_3 \cdot 2H_2O$	18, 483.
$2NH_4Cl \cdot FeCl_3 \cdot 2H_2O$	Trüb. d. phys. chem. Ber.
$2NH_4Cl \cdot FeCl_3 \cdot 2H_2O$	Bengen, Jahresbericht 1878, 1781.
$2KCl \cdot FeCl_3 \cdot 2H_2O$	
$2NH_4Cl \cdot FeCl_3 \cdot 2H_2O$	
$2KCl \cdot FeCl_3 \cdot 2H_2O$	
$2NH_4Cl \cdot FeCl_3 \cdot 2H_2O$	
$2KCl \cdot FeCl_3 \cdot 2H_2O$	
$2NH_4Cl \cdot FeCl_3 \cdot 2H_2O$	
$2KCl \cdot FeCl_3 \cdot 2H_2O$	

a caesium salt	Lehmann, Ber. L. K. Akademie (as analysis given)	10, 336.
3 Rb.C. \cdot 16 H ₂ O	diwater	to the 3. A. 18.
2 black $\ddot{\text{O}}$ to red		

In the Fall of 1894 there were published the results of a systematic study by Gobien of the soluble halides of potassium and rubidium, cesium, sodium, and lithium in water and in $\text{C}_2\text{H}_5\text{OH}$ and acetone. He did not mention the work of Beumann, which was the best work previously published, and he gives the salt $2\text{RbCl} \cdot \text{H}_2\text{O}$, obtained by Beumann, as a new compound. The salt $3\text{RbCl} \cdot 16\text{H}_2\text{O}$ will probably be more correct and his salt must have had the salt $2\text{RbCl} \cdot 7\text{H}_2\text{O}$.

The salts obtained by Gobien are -

$3\text{RbCl} \cdot 16\text{H}_2\text{O}$	$2\text{RbCl} \cdot 7\text{H}_2\text{O}$	$\text{RbCl} \cdot \text{H}_2\text{O}$

3 : 1

2 : 1

1 : 1



"minimally modified by Trotsche" (1)

Preparation of ferrocyanide.

The ferric chloride was prepared by dissolving manganese in an excess of pure hydrochloric acid and oxidizing the solution of ferric alumina formed by passing into it a stream of chlorine gas until no reaction for ferric iron could be detected with potassium ferricyanide. The solution was then neutralized with dilute ammonia to the off-white color. Next small amounts of ferrocyanide were added to prevent the precipitation of ferric chlor-

-ide at ordinary temperatures; and the amount of ferric chloride in one cubic centimeter of the solution was determined. Another solution of ferric chloride was prepared by dissolving 100 c.c. of the concentrated solution up to 250 c.c.

In the earlier part of the work saturated solutions of ferrous chloride were prepared from plumbite and the content in ferrous chloride at a definite temperature was determined; but they could not be kept free from ferric chloride. The same trouble attended the use of crystallized ferrous chloride.

In the latter part of the work the ferrous chloride was obtained by dissolving the concentrated amount of iron wire in an excess of hydrochloric acid in the vessel in which the removal-salt was to be made.

Calcine bisulfite was prepared by heating the lead carbonate until it became

with six parts by volume of four concentrated hydrochloric acid, ~~and~~ ~~and~~ ~~and~~. The aniline hydrochloride which separated on cooling was filtered off by aid of the pump, and dried on a porous plate, or by pressing between filter paper in a press. The triiodine hydrotinides were prepared in the same manner as the aniline hydrotinide.

nitroall + dyes.

Iron.—Since the conditions were complicated by the presence of tin in the sample, no method for the analysis of iron could not be used. Much time and work were, therefore, required to obtain a suitable method ~~and~~ ~~and~~ ~~and~~. A method was sought which would permit the determination of both the iron and the chlorine in the same sample, but without success.

For the testing of methods, weighed amounts of pure fuming ammonium sulphate and of iodine

pyrochloride were mixed and analyzed. Such mixtures were fused with sodium hydroxide carbonate and a little potassium nitrate to reduce the zinc oxide. The zinc oxide was reduced to zinc metal, and zinc oxide formed again, but this method gave results that were too high ± 0.5 to 1.5%. This was due, no doubt, to the presence of alkali salts retained by the zinc oxide.

Other weighed mixtures were fused with potassium pyrosulfate; the zinc sulphate formed was reduced with zinc and sulfuric acid, and was titrated with a solution of potassium permanganate. This method was discarded because the pyrochloride is very fusible. A zinc ingot was submerged carbon was kept in the melted mass and the fused mass packed over the edge of the crucible. It was found that the zinc was concerned in the reduction with zinc and the fact that the presence of any organic material interfered

ained the result.

To obtain satisfactory results of precipitation of the iron from the soluble salts with potassium hydroxide, a second precipitation with ammonia was used to free the ferric oxide from the alkali. This method although exact was too long to be so many analyses were to be made.

Attempts were also made to destroy the organic matter by oxidation with fuming nitric acid, and in potassium chlorate and hydrazoic acid; but in all cases the results were not reliable.

The method finally adopted was the following: the weighed salt was treated with a potassium bath containing an excess of a weak solution of pure potassium hydroxide. The bath was then treated in a second bath until the solution no longer gave any odor of amine or of ammonia - water was added from time to time as required. The

solution was then methylized with hydrochloric acid and an excess of the acid was added. As in many cases the amic nitroxide had been partially denatured, again in theamine, a small amount of hydrogen peroxide was added and the solution was then evaporated just to dryness. A little more acid was now added and it was again evaporated to dryness. In the case of lithium salts the oxidation with hydrogen peroxide was always greater. The amic chloride was then filtered into a flask with ice cold water, to remove the salt, and left until full of the ice. The filtrate was then treated with a solution of lithium amic nitroxide until a slight permanent precipitate of the salt in 10.2cc. When a hydrochloric acid was added and 1 gram of potassium amine was added. It was then cooled and heated at about 60° for twenty minutes. After cooling, the volume of the water

placed in the bottle. A piece of starch and a solution of sodium thiosulfate, 1 cc. which corresponds to 1 mg. of iron. The result was quite satisfactory.

The starch was placed in a glass tube tightly in the bottle, so secured the tube would. The use of the starch and the evaporation of the ferric chloride to dryness was found necessary to ensure the complete removal of the hydrogen peroxide. The hydrogen peroxide is more stable than was formerly supposed! It was found that hydrogen peroxide passed off with the steam and condensed on the sides of a flask running back into the water at the top of the tube. The water which condensed in a matching test tube in the steam above the flask, also gave a strong reaction for hydrogen peroxide when tested with iodine.

chlorine. - In the first place, in ignition, the chlorine was determined gravimetrically; but as with a chlorine & calcium carbonate react to form precipitates and colored solutions, the precipitation of the chlorine was not entirely satis-

The Ohara method was tried with a solution of a strong double halide acidified with nitric acid; but it could not be used thus, as the end reaction with the sulphocyanate was masked by the color of the acid. After the time of the halide, but the presence of the nitrogen necessitated the use of carbon dioxide. As the carbonate contained a large amount of the halide, a mixture of sodium carbonate and lime as suggested by W. L. Branson was tried; but, just then, a more satisfactory method was obtained and this was discontinued.

The method finally employed was the following:-

A weighed sample of the salt was dropped into an erlenmeyer flask containing a solution of pure potassium hydroxide, which was in excess of the amount required to decompose the salt. The alkaline solution was then boiled until the odor of aniline was no longer perceptible or given off. Then the solution, formed on decomposing the ferric hydroxide in an excess of nitric acid remained colorless. If all the organic base had not been driven off with the water vapor, a colored solution was formed. To the acid solution five cubic centimeters of a saturated solution of ferric ammonium alum was added; and the cold solution was titrated by Léchard's method in the flask.

In the case of the trans salts, a cold solution of the salt in very dilute nitric acid could be titrated directly without boiling off the base. But in most cases the method given above was used.

Water of crystallization. At first attempts to determine the water of crystallization of the salt were unsuccessful. Samples of the salts placed in the sulphuric acid desiccator did not come to constant weight even after standing more than a month. It was found that the inside of the desiccator and the watch-glass containing the salt became coated with a sublimate.

Samples of the salts were heated from 90° to 100° in a glass tube, the closed end of which was placed in an air-bath while the other end extended out into the air. Here it was found that a sublimate was formed on the outer tube. This was not at all evident when the tube was heated in an oven.

It was then thought that the water might be determined by absorption in a drying-tube. To try this a sample of the salt was heated in a porcelain boat within a glass tube which extended

through an air-bath. Air was drawn slowly through the tube while the air-bath was heated to 100°; when it was found that the chlorine hydrochloride and also the toluidine hydrochloride sublimed and was deposited on the cooler parts of the tube, while no water was carried farther to still colder parts of the tube. To test whether氯气 alone was carried on by the air current, a U-tube containing a solution of silver nitrate was attached to the first end of the tube, and air was drawn through it. After a few minutes the solution became cloudy, and a precipitate formed showing that compounds containing chlorine were carried over. This prevented further attempts being made.

The next experiment was to determine the effect of the air current on the decomposition of the chlorides of the alkali metals. The U-tube was connected to the O-tube with glass

it in cold water. The salt was heated in the porcelain boat as before, and air was drawn through the system. If the salt contained water, it was deposited on the walls of the U-tube as a dew or in drops. The amount deposited giving some idea of the proportion of water in the salt, and confirming the analytical results.

Some of the salts were analyzed before this method was used, and in three cases nothing has been said as to the water, though the analytical results require the assumption that water was contained in them.

The atomic weight used in the calculations
is assumed to be 27.000.
H, 1; O, 16; N, 14; Cl, 35.45; Si, 28; C, 12.

It was found that the differences in the known atomic weights when calculated with the more exact ~~molecular~~^{atomic} weights were not more than a tenth of one percent.

Oxidation in Ferric Chloride.

much difficulty was experienced in the early part of the work owing to the tendency of the ferric chloride to oxidize the organic base. Thus, when a solution of potassium iodide was added to the ferric chloride, the action which took place was the decomposition of the quinone iodochloride and the reduction of the ferric chloride to ferrous chloride. In many cases, chlorine, however, precipitated, remained in suspension long enough to fill the solution. In other cases it precipitated in smaller amounts, and dispersed with difficulty.

Sixty-six solutions were made in the ratio of one molecule of ferric chloride to two molecules of aniline hydrochloride, or one molecule of ferric chloride to four molecules of aniline hydrochloride, and of one molecule of ferric chloride to five molecules of aniline hydrochloride. The first solution was colourless, green on mixing, and hardened on

heating, when it became filled with the said precipitate. The second solution with a small quantity of ferric chloride was a lighter green than the first, but, on heating and standing, it darkened, and the precipitate formed. The third solution was a yellowish green color on mixing, but, on heating, the upper layer exposed to the air became green, then the middle layer turned gray, and a blue tint in the whole solution.

It was found later that the oxidizing action of the ferric chloride was greatest in hydrochloric acid solution, and that it was decreased by the addition of any aqueous acid. I will now add a note dissolving the emulsion pyrochloride in a mixture of three parts of concentrated hydrochloric acid to one part of water, and reheat with little or no formation of the precipitate.

In the work on monochlorine, as mentioned it was found that the oxidizing action of the

pic chloride until it would no longer
increase the amount of acid in the solution. Then
solutions which had been saturated with hydrogen
were left over night in the dark.

Ladenburg¹ describes the product formed by the
action of picric chloride on potassium bromate
as a blue tri-bromine-bis-wolframate.
It is a flocculent precipitate. It is colored green
by pyrochloric acid. The barbiturate of picric
acid does not form such a compound. These
results will be given in full below.

This will now be done in accordance
with some qualitative experiments as to the nature
of the salt of oxidation of aniline by chloro-
picric acid, of o-toluidine by picric acid, of m-toluidine
by picric acid and of p-toluidine by picric acid
and of picric chloride. The results are here given:

Feb. 13, 38.6 g. of aniline pyrochloride was
dissolved in 8 cc. of hydrochloric acid 1:9. pH = 1.12.

To it was added 0.5 gram of basic alumine, a few
the solution was stirred at the ordinary temperature.

Feb. 14, 11.6 hr. - The solution had changed color somewhat
slightly to a light yellowish-green.

Feb. 15, 11.30 a.m. - The solution had become a little
green in color and a slight amount of a greenish
precipitate had separated.

Feb. 17, 11 a.m. The solution had become still darker
in color and contained the green precipitate in greater
amount. 3.0 hr. - The solution had separated in
to two layers; one, about two-thirds of the volume
was dark green and was filled with the precipitate;
the other layer was a clear greenish-yellow liquid.

Feb. 18, 3.0 hr. - 0.4472 grams of o-toluidine base
chloride was dissolved in 8 cc. of hydrochloric acid of
approximately 11.2; 0.5 gram of basic alumine was added
and the solution was stirred at the ordinary temperature.

Feb. 18, 11 a.m. The solution had become a little
darker black in color and opaque. This was due

To a green precipitate which had settled in time
as the clear liquid had very nearly the same
color as a solution of ferric citronate of the same strength.
Feb. 15, 10.30 A.M. - The color of the solution had not
changed very much, but more of the precipitate was
formed. The amount being about twice that in
the solution the day before.

Feb. 16, 8. A.M. - The solution was
a brownish-yellow color, and the precipitate was still
present in considerable amount throughout
nearly the whole solution.

Feb. 18, 3 P.M. - 0.442 gram of m-tartrate, hydro-
citrone was dissolved in 8 c.c. of hydrochloric acid
12 gr. - about 1.12. 0.5 gram of ferric citronate was added
and the solution was set aside at the ordinary
temperature.

Feb. 14, 11. A.M. - The solution was a dark yellow
color in color, very much like the solution of the
citrulline hydrocitrone. In this respect the two

is more like that of the solution of sodium hydroxide - a greenish-yellow. There is only a slight precipitate in a very fine state, not like that from the α -butyldine hydrochloride.

Feb. 15, 10.30 A.M. - none of the precipitate had separated, but the amount was still not very large.

Feb. 17, 3 P.M. - The solution at this stage had about the same color as the solution of the α -butyldine hydrochloride, and the precipitate state was not so great as in that case.

Feb. 13, 3 P.M. - 0.442 gram of α -butyldine hydrochloride was dissolved in 8 c.c. of hydrochloric acid 4 per cent. about 112. - 0.5 gram of ferric chloride measured and the solution was set aside at the ordinary room temperature.

Feb. 14, 11 A.M. - The solution was clear, but the color had changed to a yellowish-green as seen in thick layers. The solution has a faint yellow color.

Feb. 15, 10.30 A.M.—The solution was cold, but the color had become somewhat darker.

Feb. 17, 3 P.M. - no change could be told in the solution since the last observation. After some time the ~~cell~~ ~~cellular~~ ~~cellular~~
there was no oxidation of the hydroquinone into

Coumarin derivatives.

$\text{Fe}(\text{C}_6\text{H}_4\text{NH}_2)_2$	with the amide.
$\text{Fe}(\text{C}_6\text{H}_4\text{NH}_2)_2\text{Cl}_2\text{O}$	Nygmae coumarin chloride.
$\text{Fe}(\text{C}_6\text{H}_4\text{NH}_2)_2\text{Cl}$	Alexandrine chloride.
$\text{Fe}(\text{C}_6\text{H}_4\text{NH}_2)_2\text{O}$	Nygmae alexandrine coumarin.
$\sigma\text{-Fe}(\text{C}_6\text{H}_4\text{NH}_2)_2\text{CH}_2\text{O}$	Benzoyl coumarine chloride.
$\alpha\text{-Fe}(\text{C}_6\text{H}_4\text{NH}_2)_2\text{CH}_3$	Dimethylcoumarine chloride.
$\alpha\text{-Fe}(\text{C}_6\text{H}_4\text{NH}_2)_2\text{CH}_2\text{NH}_2$	
$\alpha\text{-Fe}(\text{C}_6\text{H}_4\text{NH}_2)_2\text{CH}_2\text{O}$	Ferrimethylene chloride.
$\delta\text{-Fe}(\text{C}_6\text{H}_4\text{NH}_2)_2\text{CH}_2\text{O}$	Ferraldehyde chloride.
$\text{Fe}(\text{C}_6\text{H}_4\text{NH}_2)_2\text{O}$	
$\sigma\text{-Fe}(\text{C}_6\text{H}_4\text{NH}_2)_2\text{CH}_2\text{O}$	Girard's coumarine chloride.
$\sigma\text{-Fe}(\text{C}_6\text{H}_4\text{NH}_2)_2\text{CH}_2\text{NH}_2$	Alexandrolamine chloride.
$\alpha\text{-Fe}(\text{C}_6\text{H}_4\text{NH}_2)_2\text{CH}_2\text{NH}_2$	
$\alpha\text{-Fe}(\text{C}_6\text{H}_4\text{NH}_2)_2\text{CH}_2\text{O}$	Nygmae dimethoxycoumarin.

To purify the rock salt we used to melt it
and add ~~to~~^{the aid of} the same about 10% of it
in iron filings, and the rest of the sulphuric
acid was extracted by letting them stand in
a crucible over sulphuric acid and cold hot
sulphuric acid. This method slightly mottled
the salt and my classmate who had the ex-
periment in his analyses told me that

the salt was not fit for use in
the laboratory because it contained
the metal of iron which made it brittle
and it would shatter if not handled with
care. The iron was removed and the salt can be
recrystallized only when concentrated sulphuric acid.
Some of the salt we obtained from the salt
was combustible, while some is brittle & the rest is like
glass having some lime added to it.

Dicaine citrate, Feb. 26th, 1911, Cl.

Solutions of dico. citrate and cocaine hydrochloride in the ratio of 2 molecules of cocaine to one of the latter, of 3:1, or 4:1 and 8:1 give this salt. The solutions 2:1 and 3:1 are the purest examined and are at present another preparation, a copy of this salt.

Salt of dico. citrate. It is made by adding 50 c.c. of a solution of cocaine hydrochloride containing 6 grains of dico. citrate, about 50 c.c. of hydrochloric acid, nearly dry ice into the incubated salt to the point of melting, and mixing in it 2.4 gms of cocaine monohydrochloride. After crystallizing for some time in the sand-bath and drying, no yellow spot on the salt is visible, though it is a pale yellow color and contains yellow over stains due to it, which appear after the salt has been dissolved in water. This salt is in use I now in a

gravelly; the soil is white with green
in color. The sand is very dry. No
water was given on melting the salt.

Sodium chloride 3.1. - It was given in this
salt soil on melting a cup of the experimental
nitrate. The potassium was stored in
calcium soil for a week and a half on being
thick needles, which after drying appeared to be
the same when salt dissolved from solution
2.1. Not enough of the salt was obtained for
analysis.

Sodium chloride 4.1. - A solution was made
by adding 2.4 grams of sodium chloride to
32 cc. of a solution of pure calcium, containing
12 grams of bicarbonate, and mixing. Ninety
ml. of water were added. This was considered
of the pure chloride on the evident appearance
in this case, as the solution was more or
less than one milliliter. The pure chloride

formed was dried off at 100° just until
the water was volatilized, but no salt or
dust. After further evaporation moisture
was still present, so it was placed
in nitrogen. It had a resinous brownish
black flavor, as given. On standing over
sulphuric acid a second mass of the oil was
soon collected which in solution, reacted on
strychnine and found. Evaporating this
material in nitrogen. The oil was a pale yellow
resin.

Calcd for	Found
$\text{Fe}_3\text{C}_6\text{H}_5\text{NH}_2\text{O}$	4.11 2.11
Nitroline 42.04%	41.87% 41.85%
	42.01% 41.95%
S. n. 13.30%	13.04% 13.34%
	13.08% 13.38%

The salt would obtain its share
from water to be in the proportion
to which it was dissolved, or rather a solution
containing salt will have the
same power. By the dissolution of a certain
quantity of salt we get a saturated in
water suspension. This salt is suspended
in water of a certain salt and is saturated. Such
solutions are called brine belonging to the
salt water or standing.

Fractional Distillation, see Colloids, Art. 120.
Distillation in the heat of 41° was made to
obtain 100.0 g. of sucrose, which contained
32.0 c.c. of a sodium hydroxide solution, which contained
12 grams of sodium hydroxide, and dissolved in
a mass of 200.0 g. of sucrose solution. The
salt was added to the salt-sugar and converted
it into a salt solution. The solution was

the epiphyses - and a chip of bone in the
right tib. ~~gave~~ system. From the condition
and position, it was difficult to tell exactly
what had occurred. They were in the same
place, thin needles, a non-mineralized section broken
short, but otherwise good. They were made of a
dark, silvery metal. They were made of a
dark, silvery metal.

The result of the analysis was as follows:-
Copper 2.68, Nickel 11.6

Cobalt	40.32%	40.26%
Nickel	12.70%	12.68%

There was nothing in this which
was not found in the other needles
investigated, and there was no
connection with any which were made
of other metals or the usual
metals.

July 10.

A solution was made in dil. nit. 8 lit. containing 12 gms. of the catalyst and 12 g. of zinc in the form of fine
cristalline dust. This was left on the sand-
bath, and after a few hours
solution obtained; on cooling a bottom of a
fused it no longer with the catalyst, but
but oxidized in drops. This solution was
then extracted with ether and dried over
in compact masses. The solution was left
over sulphuric acid to increase the yield of the
compound, and a sudden change in the reaction
caused the solution to turn about and the com-
pound to boil. The ether was never
boiled so long as the crystalline catalyst
in this case would remain unchanged.

This gave about 100 gms. of a yellow
yellowish orange powder which was

within 41.0°, and remained at the
surface until the end.

The first sample was taken at the
surface, and the bottom sample was
gathered at 40 fms. The solution is
not saturated with oxygen, though it is
about one-half the maximum saturation
level. Most of the dissolved oxygen is
in the surface.

At 1000 fms depth, 15.6°, 41.0°.

The preliminary work on this cast was entirely
unsuccessful owing to the oxidation of the main
sample bottle, which exploded. The remaining
samples were taken with great difficulty
as the water is very turbulent and
turbid. The oxygen does not rise readily
at this depth in the samples. The water
seen, and in the sea, is usually turbid

It is believed from some experiments I made
sixty years ago, with iodine & iodating, that a
point of iodine coming out of decomposition of
sugillic acid, it is found in the same
very much crystallized & dried, when no
crystallized excess can be in the middle stage
of a solution.

The salt is very soluble in water, a iodine and
water mixture, but it is decomposed at the same
time, and the iodine & iodide will be a
blue hydrosoluble & form the blue iodite
previously described. The solution of the salt
in cold hydrochloric acid shows a blue tinge
from a light yellow now in acidic solutions, to
a bluish green and in neutral solutions
which have lost some iodine.

When the salt is applied, however, in
solution in water, it sets up a solid mass
in which is a column of the salt in

which you will see in the signature
and colors I used when we had the
carpet made at the same time.
The colors are only green, blue, yellow
and white with a touch of red here
and there.

The following table gives the results of
plastic modulus and ultimate load-carrying capacity in all
the ratios of 3:1 2:1, 1:1, 1:2, 1:3, 1:4 and 1:8.
In the conditions 3:1 and 2:1 either this or
a smaller value was used. In the
case of the two ratios adopted in the
table, from the number given a cap of the
minimum cross-section may be calculated, as is
described.

solution in which 3.1, 24 c.c. of a solution of
dilute alkali containing 7 mm. of Na_2CO_3
was titrated with 10 c.c. of concentrated sulphuric
acid and in it was added 2.4 grams of sodium

concerned. The author was evidently not
fully thinking; but he seems to have written
in the author's name, and I hope
he would welcome the ^{gave} present signature.
Not thinking of it at the time, he could not take
any express, so he wired that we may have
that he would.

The author is a very poor reader
and I do not think he will be able
to understand my letter in
~~the~~ a form of German, unless I would write it in
both of these cases we must make the writing
as simple as possible.

Published in Frank.

Feb. 12, 1890	Feb. 13, 1890	Feb. 14, 1890
Medicine 33.88 ¹⁸	34.38 ¹⁸	33.20 ¹⁸
Star. 5.96 ¹⁸	6.01 ¹⁸	5.78 ¹⁸

Franklin in with 216 local, or a month or
five days earlier or so, I think.

and added 16cc. of sodium iodide solution
to the same amount of the solution.
After adding this solution, we made
the same solution and added another 16cc. of
iodine. 10 grams of the salt was obtained.

Sodium iodide 16cc. of sodium iodide
was made by mixing 16cc. of a solution of iodine
of 3.1 g. per cc. with 16cc. of a 10% solution
of sodium hydroxide. After adding
4.8 grams of sodium iodide to the solution
3.1 grams of a salt was obtained which was
a yellow crystalline mass in the sodium red
aqueous solution. This salt of the mass
was washed with the following:

Liquid air Freezing point

Tetraethylthiokoll 16.21 15.17

Acetone 33.97.8 33.44.8 33.48.8

Acetone 33.97.8 33.44.8 33.48.8

This was the result after separation. It will be seen

sample 211 - soil - soil - soil - soil

Sodium sulfate 1.2g - 1 volume of glacial acetic acid - soil sample of soil which - was added to 20cc of concentrated nitric acid and 9.6 grams of anhydrous nitro barium was dissolved in it. It was difficult to dissolve all the soil in the acid but it was solved in the acid and the soil was completely dissolved in the solution. 6.45 grams of the soil sample was placed on a piece of filter paper in the bottom of a test tube and the filtrating solutions. They were also of advantage to color when in the solution and when dry they had a brownish color.

Sodium sulfate 1.4g dissolved in boiling 3 grams of glacial acetic acid and 8.5 grams of anhydrous nitro barium was placed in the bottom of a test tube and the soil sample was added to the soil

on cooling it became very solid with the salt.
It was fragile, broken with tiny numerous
small golden particles. The salt dissolved
in water readily. The amount of salt can't
give the following results:

Estimated by	Found by salt plus	
Mr. G. L. A. H. C.	salt 1:2	salt 1:4
Potash 33.44%	34.64%	33.45%
		33.50%
Water 3.28%	5.01%	2.73%
		2.11%

The salt was first obtained from a solution
in the ratio of 1:4 as follows - 11.6 cc. of
a solution of 33% potash containing 3.86 gm.
of sodium chloride, was diluted to 85 cc. with
water and 3.8 gm. of salt added with the
salt of 33.44% which were dissolved. It
was all dissolved and the solution dried. It contained

exp. the salt water was followed by
by other. The salt water from the wells and
the sea water from the ocean were
the same salt water which in the sand they
show a distinct salt water. The very salt water
which had the sea-water coming in the side
about it was a salt water. - ~~The~~ ~~Sea~~ ~~water~~
~~Sea~~ ~~water~~ ~~water~~ ~~water~~ ~~water~~ ~~water~~
of the sea water was obtained

just as above. First of the salt water
and showed the analysis; a second last
was recognizable when concentrated. It was
very salt. The next time the salt water. We
had a salt water and
was passing over after in the saline. I did not
know from this situation or saline is our
saltwater will change the salt water
we are getting at the sea water. The
sea water has been the salt water.

The following are the most abundant

of the species

Scaphygetes

languidus

Phormia regina

Scatophaga stercoraria

Scatophaga

The following observations were made at the first

time of the collection. At the time of the day

of the collection, a bottle containing 3 pieces of white cotton and
181 grams of brown salt mixture. The salt
was collected at the same time as the cotton. The cotton
was the same as the last collection.

White	33.94	X
	33.67	X
	33.78	X
	33.77	X

The last pair of numbers relating to the

longer specimens of the maximum of
heat were obtained from solutions of alumina
in carbonic acid by heating during the time
the salt dissolved by the action of light which
will be given below. The expansion of the salt
at first will become extremely
minute, which in the absence of water or
moisture has been observed to occur in less
than one hour in a solution of the alumina which
collected the heat.

The next to the last pair of numbers relate to

in which it is evident in the
devoid of maximum value.

The mean value of this soil solution
was the same as with addition of one
molar salinity.

and the following results:-

Conc.	I	II	III
0.05 M NaCl	33.83	33.44	33.61
0.1 M NaCl	33.68	33.44	33.55
0.2 M NaCl	33.11	33.11	33.78

Ayres hexamine dissolved in the salt solution
a solution of some acidic and acidic
salts in the salt solution indicated in which
the salt cannot be completely removed by
the range indicated, the maximum value.

This was followed around 1900 by the appearance
of the first steamship.

32.13

5.18

Fluorotellurite (F₂Tl₂O₇) ^{CH₃C₆H₅O₂}, N H₄Cl₄
It first forms a pale yellow salt with
this volatile acid, which decomposes
and dissociates, owing to the addition of the
acidic volatile salt.

A solution of zinc oxide and zirconium
oxide introduced in this volatile acid, and ~~left~~
left and left concentrated, was made in
a glass tube and placed at bottom
of a flask containing a solution of
mercury and iodide under a dry-ice-salts
refrigerant. After a few hours, a white
exudate was observed, on stirring off
the zinc oxide, one layer of crystals, in the form
of small cubes, was seen, the other layer
stirring up quickly. But on removal of the
flask from the cold, the upper layer dissolved
in the solution in the tube, and a

soluble in the ratio of 2:1 were found. From
these dissolved may a slight amount of the
chloro-salt was obtained which will easily be
converted to bromide. ~~The~~ was also found
From which a solution was ob-
tained and the solution had
the same properties & solubility as before.

Experiments made in the ratio of 1:1 gave one
a very strong solution, contain-
ing 60 grains of bromine dioxide, and 5.27 grains
of bromine dioxide dissolved in 34 cc. of ^{dist.} water.
This salt and 3cc. of the concentrated acid. The
solution on heating became yellowish green
then quite black and seems to decompose. It
was then about the same filter and washed
with dilute sulfuric acid. After removal of a
soft mass, the salt seemed to decompose
with some bromine dioxide remaining in it
and the remaining mass with the solution.

3.4 gms. of the solution were collected and titrated
 against standard dilute sulfuric acid, using
 phenolphthalein as indicator. The
 titration was carried out with the
~~titrant~~^{titrate}, and 5 cc. of concentrated sulfuric acid
 was added to dilute the acid added
 on this, when there was a slight extinction. The
 titrability decreased, after adding the nitro
 group, probably due to the fact
 that the solution contained the sulfonate form
 of the salt, when adding the nitro
 group of the salt was obtained. After adding
 about a filter paper in the flask the size of
 the test sample turned to a powder.

Sample No.	Normal
Yellowish NH ₄ Cl	Almond
White 29.02%	27.48% 31.49% 29.55%
Am 3.20%	3.30% 3.36% 3.38% 3.35%

which can easily affect the blood
and common sense in the sick; and if the
acid in the body was屏除。

Antimony in Sulphuric Acid. It was thought
that the volatile salt might be obtained from
solutions of pure antimony and sulphuric acid by
allowing the solution in ~~water~~^{nitrate} to remain with the
acid by saturating the solution with hydrosulfuric
acid gas. This was tried with some success
and it was found that all the antimony could
by this method be dissolved.

By this method the hexavalent chlorine chloride
was obtained in a state of solution in
a solution of the volatile salt with the acid
gas. The acid gas was obtained by
saturating a weak solution of antimony
salt and passing carbon dioxide through
it.

silver nitrate solution. The silver bromide
was removed by the ^{dilute} dilute nitric acid
and washed until it was perfectly
silver free. Six drops of water and six other drops of the
salt decomposed with the constituents, which
then caused to form the crystallization of
the bromide to salt giving a white solid.
The crystals of the salt were collected
and washed with water and dried
in the air. This is about 0.2
moles - 100 g.

Another experiment was made
using 8 grams of silver
nitrate 10.7 grams of 5-bromine
benzoic acid and 10 ml of
water. The solution was allowed to stand
for about an hour and was then
filtered - the filtrate obtained after
filtration was washed so that the solution
was green. This was the case with water

silver iodide set in the filter paper. After the solution had been filtered off, the filter paper was washed with water, and the precipitate was collected. After filtering the solution it was allowed to stand over night, when a small amount of salt was present in the solution. It was then crystallized in benzene. 108 gm. of silver iodide were obtained.

Soln in 100 ml. of 21% - 32 cc. of a solution of feric chloride containing 12 gms. of feric chloride, and 5.27 mmoles of potassium chlorate gave a salt as an amorphous mass, a few small crystals, but other than was not noted - after the salt solution was mixed in with hydrochloric acid 400. This solution was filtered off and very slowly allowed to dry. Feric chloride had combined with the
^{slightly} salt and converted to a white
ferric chloride. 800. remaining about 200

Sodium in the salt water. To 100 cc. of
the salt water containing 8 gms. of
sodium chloride ~~was added~~^{were added} 3.28 gms. of sodium
chloride. It did not all dissolve. The
solution was made saturated with the dissolved
salt. It became heated on adding the salt
so that it would not be in a
solid state.

Sodium Chloride		Sodium Chloride			
2	-6	NH ₃	2	-6	NH ₃
29.318	29.318	29.338	29.338		
29.318	29.318	29.318	29.318		

Sodium in the salt water. To 100 cc. of

chloric acid we had ~~had~~^{left} until now instead
of hydrochloric acid 140 gm of silver nitrate and 353 gm
grams of potassium hydroxide were added. On
dissolving with hydrochloric acid the solution
became neutral sooty with the salt which remained.
The salt was filtered off and as much of the
silver as possible was dissolved in one of the
filter-wash. This salt was divided into two
parts, part I was purified by washing with
water twice; part II was decomposed by dissolv-
ing it in water with sodium carbonate and then
part III was recovered by isolating
in dilute
in ~~the~~ salt and dissolving the solution with
the ~~acid~~ base. There was no colour on the
solution but it contained the silver nitrate
as both silver and chlorine.

The ~~silver~~ ~~silver~~ nitrate was the
remaining product.

Winkel	Grund	Winkel	Grund
Winkel 100° 10'	Grund 100° 10'	Winkel 100° 10'	Grund 100° 10'
Winkel 100° 10'	Grund 100° 10'	Winkel 100° 10'	Grund 100° 10'
Winkel 100° 10'	Grund 100° 10'	Winkel 100° 10'	Grund 100° 10'

was soluble and insoluble and lastly
when on heating with heat the insoluble
insoluble and the solid substance left
no soluble residue the latter being
insoluble.

The analysis of the mineral gave the following
results:

Element	Weight	Molar Weight
Calcium ^{CaO} Ammonium ^{NH₃Ca}	10.18	111.12
C - 29.51%	64.1	64.1
C - 3.2%	3.2	3.2

A sample of the earth from which 10% was
removed at 95-100°C, when it gave off water
when heated to 125°C it was found that a white
insoluble substance had been formed.

The earth which contained the
water, was by addition of calcium oxide
and insoluble substances were formed.

The next day it was attempted to reduce the
nitro-aminic acid solution of 10 gms.
The reduction was incomplete, the same
being only partially reduced. The same is evident
with a strong dilution of the amine
and a trichloro-borane added in the 2.1
and 3.1 gms on analysis the following results.

Calculated by	Found to result from	
nitro & ^{amino} NH ₂ CO	col. 2.11	col. 3.11
amine 2.11	2.115	2.115
loss 5.20%	5.15%	5.35%

It was next attempted to reduce
a dilute solution of nitro-aminic acid
containing a large addition of amine
outward and without success. A dilution of
the result of 20 volumes of amine added to
one molecule of nitro-aminic acid to dilute with
water gave 2.11% of a solution of nitro-aminic

- taking of some phosphate and other
forms of the available phosphorus. Then the
solution will remain in the soil with little or no
inactivation, capable of reuse. If however,
the phosphate becomes adsorbed
and largely desorbed, brought again into solution
to leach down the available form on many occasions.
In which the solution is used it can
make a new, the available form does not
desorb, nor can it now soil the solution and
be used.

Attempts were also made at certain areas
down a very nearly saturated solution solution
solution containing 8 grams of lime in which
was added a few drops of a 10% solution
of phosphate and a few drops of a 10%
solution of calcium phosphate.

Antibiotic and Antitoxin in Tetanus

Treatment of Tetanus

As you will see in the last section, the value of the various types of antisera to the treatment of tetanus is questionable, if not doubtful.

It was said above, we will ^{be} do well to use the antitoxin. But, salt was dangerous and could not always be administered in combination with the serum.

Serotherapy in the relief of tet. - A solution of one milliliter containing 1 gram of horse serum was diluted up to 10 cc. with approximately 100
gives us ~~100~~ ~~100~~ mg. or about 10 mg. of antitoxin. This dilution of the antitoxin was useful. The administration of this dose did no injury, and the condition of the patient was relieved at the end of 24 hours. He was still weak at the beginning of the second day, but he had no spasms, and slept well all night.

which was not salt. The water was then
boiled and the solution was made
acidic to carbon dioxide. When organic acids had
been added in pairs, ^{at first} salt was not obtained
unless they depended on taking the solution
out of the thermometer.

The salt of this solution was obtained by
the addition of 150 cc. of a solution of lime
sulfite containing 19 grams of lime sulfite. From
this no salt was obtained.

The salt of this solution was obtained
by the addition of 150 cc. of the lime sulfite
solution and was washed off, then
again saturated with hydrochloric acid and
then again washed off. This was then
boiled in excess to 26 cc. and was found to
be much as sufficient and should

be used ¹⁶¹ solution in the ratio of 1:1000.
and here it must be said that the acid

very thin boundary and was submerged
into the salt solution. The tiny bubbles
and the water became lighter. The evaporation
continued until water and bubbles in the water
nothing remained, until the bubbles came to

more than the maximum size possible in the

The salt was now enough to be rejected,
but from this solution the yellow potassium
water. In drying, the salt has been given
water in more salt except you can now
dissolve it. It does not come back like in the
first salt, and not soluble. - It goes and
comes and when the water comes it comes at
constant intervals of time. This is my first time
A salt solution in the salt water one

gives rise to the column which will contain
silicate hydrate. This may dissolve in the
acid, and the acid solution then will decompose
and release hydroxide which may pass
into the column at about 13° when some of the
silicate hydrate will be transformed
into a silicate with the loss of water. There
are no exotherms or the exothermic hydration
seen in this case. The salt was purified by
solvolysis. The original product was very
moist - damp. The salt was anhydrous.

ANALYSIS
A sample weighing 110.5 mg. of which contained
118.2 grams of anhydrous hydrosilicate in the
form of small, thin, flat, glassy, irregular
crystals. It was titrated against standard
concentrated sulfuric acid, the solution being
continually stirred.

and the salt separated from each other. The salt was soluble.

The solution was then heated to 50° C. and mixed with one mole of the salt solution. This reaction was slow at first, but after about 10 minutes the salt was completely dissolved. After heating the solution for another 10 minutes, the salt had completely dissolved.

Solubility in the salt of A.R. - A solution was prepared containing 5 grams of zinc sulphate and 0.58 gram of ammonium sulphate, which had a volume of 100 ml. The solution which was cooled in ice until water was added with the zinc sulphate ^{deposited} ~~separated~~ first the salt. Then it dissolved, and the salt became a white precipitate.

The weighed portion of the salt was dissolved

Catalyst	Found in salt m. wt. & $\text{C}_2\text{H}_5\text{OH}$	soln.	soln.
Alumina 89.42%	89.11%	89.74%	89.41%
Soda 12.81%	12.81%	12.80%	12.80%
Iron 1.81%	1.81%	1.81%	1.81%

Solution in the salt + 0.1% Alumina
 and 0.1% $\text{C}_2\text{H}_5\text{OH}$. Some of insoluble hydroxides were removed by centrifuging.
 After standing over night, the solution was
 seen begin to melt at ordinary temperature. It
 a dark blackish oil solution. The solution
 was placed in ice-milk and saturated with
 hydrogen and gas, when the oil solidified.
To cold water this solid looked like the
 insoluble hydroxides from the 1% solution.
 On removing the solution from the ice-milk,
 most of the salt dissolved so that it can
 not be obtained in condition of insoluble.

The solubility of gold is in $\text{Fe}(\text{CN})_6 \text{NH}_3\text{Cl}$.

The salt did not dissolve in very saline-
gold solution; only one salinum was obtained but
enough to examine. When solutions in the ratio's
of 1:3, 1:4 and 1:5 were saturated with hydro-
chloric acid most of the lower salt dissolved
out, an equilibrium of the salt, the acid and
silver in crystalline form and the higher
salt was produced.

Solution in the ratio 1:3. - To a solution
of 2.645 grams of an-stibidine hydrochloride
in 6.2 cc. of ^{dilute} hydrochloric acid was
added 3.88 cc. of a solution of feric chloride
containing 1 gram of feric chloride. The filter
containing the solution was placed in cold water,
and hydrochloric acid gas was passed into it.
When the salt dissolved, the water was flooded in
crushed ice, while the saturation with the acid
gas was continued. The solution became about

the methyl alcohol to water; at first
the solution were the yellow plate as in solution 17,
then there were bunches of crystals that looked green.
This was ~~at~~ taken up with the stirring, and
and 2.0 cc. of ~~of~~^{1/2} hydrochloric acid was added.
On continued absorption of hydrochloric acid p. 18,
the crystals changed form and the yellow plates
were replaced by finer crystals of a lighter yellow
color. When the change seemed to be complete, the
mass - which looked like the hexamethonium
chloride as it separated from concentrated
solutions - was filtered off.

The salt formed a sticky mass fuming with
hydrochloric acid. It was very difficult to be-
have for analysis being deliquescent in the air
and adhering to the stirring-hair. The salt which
was not - part of it having been dissolved by
the moisture of the air and adsorbed in the stir-
ring-hair - was further dried in a desiccator.

Part of the salt, being the finely-grained mass dissolved in hot concentrated hydrochloric acid, and the solution was cooled in ice-water. The salt which separated was the chlorobarium carbonate. The analysis of the dried salt gave the following results;

Chlorine 35.61% Iron 10.12%

The ratio of the iron to the chlorine in the salt was 1:3.57. Taking the salt as 100 the salt must have been 35.61% chlorine, or 64.39% ferric chloride; to which the calculated percentage ~~are~~ chlorine 35.83% and iron 9.45%.

A second solution, in the salt at 100, was prepared which contained the same amount of pure chlorine and chlorobarium hydroxide but whose volume was 15 c.c. This gave, first, a turbidity. Afterward, the continued action of the hydrochloric acid was perceived the same change as before but the turbidity

which separated seemed to be a mixture of the two salts.

The ratio of the concentrations was changed to 1:6 by the addition of 2.645 grams of the boric acid chloride in 8 cc. of hydrochloric acid. The solution was warmed to bring all the salt into solution. When it had been cooled and dry hydrochloric acid gas passed into it, the diborane dihydrochloride was formed without formation of the oil. This salt did not give rise to the large salt - form which was formed when the beaker was removed from the ice-water over of the salt dissolved. The difficulty may have been the greater dilution of the solution. A solution in the ratio of 1:6 was prepared containing 0.5 gram of boric chloride and 3.05 grams of m-bromine hydrochloride in 10 cc. of water. The diborane dihydrochloride was formed first, then some of the original fine granular

infused with water - a solution of fine
mica. After one to two hours the whole of the
crystalline seemed to have changed over to this
form.

All attempts to get this crop of crystals in
readiness for crystallization failed. The salt
could not be entirely separated by the use of
the filter-pancup, and the solution was so thor-
oughly acid that the drying-paper was disintegra-
ted and mixed with the salt, so that they
could not be separated. No further attempts
were made to prepare this salt.

To Prof. J. W. G. M. & T. G. C. N.Y.C.

Minerals. The first had no known
minerals and had the highest percentage
of water-soluble salts - as was the tendency, notwithstanding
the presence of silicate minerals. The samples of the salt
and brine were carefully tested that the
composition was not constant, the same as one
mineral. This was observed by the
use of a microscope, as well as by
constant observations made in heating
and cooling the samples.

Several tests made in the salts of 1:
1:1. From solutions in the salt 1:1:1
a boracic acid was extracted. This was
done in the ratio 1:1 and the solution
which contained the boracic acid
was neutralized. The solution of the salt
was then heated.

It was found that the solution
was

it; probably the same cells become
more numerous as the virus
increases. At 0.8% $\text{pH} = 7$
virus-free medium was added dilute
 $\text{H}_2\text{S}\text{O}_4$ to $\text{pH} = 6$ and 31.2 ml. of
0.5% chloric acid being 2 gms of basic
chloride were added. This was a solution and
brought to the same volume as the
phosphate solution. It was then placed in
the cold, and ~~in~~ the ice bath. After the
virus had been ^{quite} adsorbed
the fluid was centrifuged at 10,000 rev/min.
The supernatant will be the virus free
medium and the sediment will be
precipitated in the adsorbent used. Could be
well strained if ~~this~~ ^{was} not difficult
enough. The virus solution can now
be treated in short times with various
reagents. If they are made up dilute,
and then added to the virus solution.

Southern California, 6 or 8 ft. - dissolved sand
grains and iron pyrite and dolomite
and magnetite and talc and mica
and ~~calcite~~^{dolomite} and gypsum. The south
was broken off. This sandstone
contains much talc and gypsum
until it was strong, when it was fine-grained
and made of talc and iron pyrite. Then
the talc was replaced by dolomite
and gypsum - dolomite weathered; this west
was replaced by a yellowish sandstone
which was in its mass like a large
yellowish sand. So fine down the sand
was down to the bottom of the plain
absolutely friable.

The sand was analyzed. To calculate the
percentage of each mineral, the
percentages of each mineral were
calculated from the ~~original~~ ^{original} analysis

Time	Conc. FeCl ₃ Molar	Conc. K ₂ CO ₃ Molar	Conc. HCl Molar
1 hr.	0.010	0.010	0.010
2 hr.	0.020	0.020	0.020
3 hr.	0.030	0.030	0.030
4 hr.	0.040	0.040	0.040
5 hr.	0.050	0.050	0.050
6 hr.	0.060	0.060	0.060
7 hr.	0.070	0.070	0.070
8 hr.	0.080	0.080	0.080
9 hr.	0.090	0.090	0.090
10 hr.	0.100	0.100	0.100

Sodium in the ratio of 6:1. 0.081 g. was added to a solution of sodium iodide and added to 1.3 ml. of a solution of ferric chloride containing 0.01 M. The solution was colorless and no precipitate was formed. Upon addition of acid gas was evolved and a brownish red precipitate was formed. The precipitate was collected and washed in the same manner as before. After the washings had been completed the precipitate was dried well and weighed, giving 0.016 g. of Fe(OH)₃.

soft when cold & becomes harder upon warming.
A strong solution was made up for the
test expt & that it was soluble until it was
diluted with water. The solution was then
mixed with dilute nitric acid & it soon
became crystalline again & an excess of the salt
was obtained.

The result of the analysis of the sample
of the salt was the following:

Element	Calculated	Found
Fatty $\text{C}_{12}\text{H}_{22}\text{N}_4\text{O}_2$	35.85%	35.85%
Chlorine	35.85%	35.85%
Iron	1.45%	2.35%
		10.01%

Take one g. of the
silver nitrate and
one g. of the
silver hydrosulfide.
The result is the same
as with silver hydrosulfide and
silver sulfide, and the mixture of both with
silver sulfide. The first results were not obtained
in the same way as the second,
but the same method was used.
From two to three drops,
the following results were ob-
tained: Solutions of ferric sulfide and
silver hydrosulfide in the ratio of 3:1-1:2,
in slightly acid solutions gave mixtures of
silver sulfide, silver sulfide, ferric sulfide, and
silver sulfide. I don't need to tell you what
this is, nor need I tell you that it looks like
tan or olive green. When dissolved in
water the solution is a yellowish green.

which with the air at which other vapors
and oxides of carbon were also determined
in the same manner. From the results
that the barometric pressure was constant
it seems that the barometric pressure
was obtained by the method of decompression
from the ordinary readings of the barometer in the
open air. After a solution of the sodium
nitrate was dissolved in water and added
to the solution, the solution was
dissolved in water, and the solution was
then analyzed, and the following
are the results.

This salt was analyzed and it showed
the following results:
0.2133 gram of the salt gave 0.2872 ml. N.O.
0.2635 gram of the salt gave 0.0198 ml. N.O.

absent of iron.
The ~~area~~ was made by casting the
iron in the sand cast iron mold
in which the iron was to be cast
out.

Cobaltiferous sand.

Fe 3.62% Ni 2.1%

Cobalt	3.98%	33.03%
Nickel	5.88%	0.81%

The first two areas were broken
out and mostly freed from the mother-sand upon
which they were placed in a
box they could be fitted in a casting
the mother-sand. The next area was
broken in the same way. The last one
was the continuation of the first and it
was broken into pieces to be used in
an exhibition to our friends.
It was also found that a small part

soluble in plain dilute acids, but
 soluble in dilute ^{boric} ~~acids~~ acids.
 It is soluble in water but precipi-
 tates as a concentrated gel when
 acid was added to the solution. The
 size of the flocs or angular granules
 of the mica on the walls east and
 over the strong acid come in contact with
 them was very interesting to note. The
 angularity of these granules of mica
 soluble, the forms of which could be ob-
 tained, in the first coating of the solution,
 were from the acidic east.

It seemed to be zinc yellow-greenish on
 analysis and seems best to be
 $\text{Zn}(\text{Cl}_2\text{C}_6\text{H}_5\text{N}_3)_2 \cdot 2\text{H}_2\text{O}$ - or the last.

$\text{FeCl}_2 \cdot 2\text{H}_2\text{O}$ with $\text{C}_6\text{H}_5\text{N}_3$	Found
Zincine 33.57	37.23 ± 2.82%
Corn 18.28	17.77 ± 1.18%

1. Sulfuric acid solution.
This salt was dissolved in 200 cc. of an
existing oil which contained 0.001% sulfuric
acid. It required about 114 g. of sulfuric acid
to dissolve 100 g. of the oil. This
mixed with the sample.

This series of experiments involved
the same salt in the 10.7644%, 3.1121% and
1.11%.

Solution in the salt at 4.1%. This solution
contained 8.82 grams of formic acid and
2.22 grams of aniline hydrochloride in 50 cc.
of water. It was taken to a cold bath
and was cooling out salt hydrate. When it
was black in color, a crop of the salt was
removed. By the next morning the
salt crop of the salt was dried and the
solution was taken to a cold bath
and cooled off completely.

Solution in the ratio of 2:1. - This solution contained 0.58 grams of brown aniline and 2.22 grams of aniline hydrochloride in 39 cc. of water. The solution was boiled a short time and then cooled, while the light yellow salt separated out entirely. This was filtered off and washed for analysis. The next morning a second crop of the salt had formed, but it was washed off again.

Solution in the ratio of 2:1. - This solution was composed of 0.56 grams of brown aniline and 2.22 grams of aniline hydrochloride in 29 cc. of water. After boiling and cooling, the solution ~~had~~ deposited about twice as much of the light yellow salt as did the solution 2:1. Both crops of the salt were separated from water. The second crop of the salt in this case did not dissolve completely in the water.

In the 2:1 ratio, the solution

contained about one eighth of the mixed
 gases and was in equilibrium. It must be
 the standard gas both in volume and pressure
 and in density. The salt was dissolved in the
 mixture of ~~water~~^{dilute} hydrochloric acid and heating
 it over the open flame until there was a
 loss of the light volatile oil which entered
 the water and was removed by the
 inverted bell and the inverted bell was placed over a
 small dish.

The analysis of these gases gave the following

Calculated for	Dissolved in water				
Fatty Acids	35.75%	35.81%	35.75%	35.75%	35.75%
Acetone	35.35%	35.35%	35.35%	35.35%	35.35%
Water	35.88%	35.82%	35.85%	35.85%	35.85%

After the soil had been washed, much sand was left, but some of this was retained and the remainder washed off. The solution was then carefully taken and the solids and scum removed by a fine sand filter. The water was then passed through a sand filter and the sand removed. The sand which remained was then washed and dried and the sand which remained was then washed and dried again. This was then passed through a sand filter and the sand removed. The amount of sand which remained was as follows:

Weight of sand	Weight of sand
150.00 gm. & 2.00 gm.	
150.00 gm. 33.37 gm.	33.38 gm.
150.00 gm.	33.38 gm.

The sand which remained was washed and dried and the solution was then passed through a sand filter and the sand removed. The amount of sand which remained was as follows:

the mass. This will be small at first but gradually increase until it becomes
large enough to be of use.

The salt is now small & the water will decompose the sulphuric acid so
that the salt is fully washed away and the
salt solution is dissolved in water, and the
water is then added to the salt solution
so that the salt is thoroughly decomposed and
then at 80° C. The salt loses weight when
subjected to heat in the sulphuric acid
solution of sulphur, the hydrogen sulphide
is evolved.

The process continues until the
sulphuric acid solution has been
fully decomposed. This is not always the case
as the salt may not be completely

Fusco-ochreous and blackish-green.

This sort was obtained from sand which
was well sorted though the material was
fairly fine. It was associated with a
matrix of the same lithology, and the sand
was also well sorted and contained no
coarse material.

Blackish-green - The sand which is blackish-green
was composed of fine-grained granular material of
brownish-yellow and a very scattered mixture of
fragments of a brownish hydrometeorite. This sand
was found near the surface at one point
gave a blackish-green color.

The second locality, in the south E.I., was made
by mixing 2/3 of the surface sand with

with a saturated solution of potassium ferricyanide
which is brownish. From this was obtained a thin
yellowish-green layer which contained a few

with no distinct yellowing of the skin and
in my opinion the normal sulphur content.
After the time of treatment, or in other
the normal sulphur content was determined
by the method of the author.

The first solution was composed of 12 gms.
of silver nitrate in saturated solution and
one gram of stibnite dissolved in water
and diluted to 100 ml. ~~100 ml~~.
With this the author obtained a mixture
which contained 10% silver nitrate
and 10% stibnite.

Solubility in the salt of 11. - It is known
that this solution did not contain enough acid,
a second solution was prepared thus: One in
a beaker containing 100 ml. of
a solution of iron sulphide, a second
a solution of 4.5 gms. of stibnite dissolved in
water.

In 1500 g. of undiluted hydrochloric acid and
the solution. The solution was then cooled,
when it was composed of 44.75 g. of a
solid, which dissolved on the cold, dilute hydro-
chloric acid, but which remained on the filter, was
of a light green color. 3 grams of the dry sub-
stance contained, by analysis, the following

Quantities

Found.

Chlorine 26.62%
26.61%

26.37%
26.68%

Iron 8.42%

8.10%
8.37%

Apparatus for the Analysis of Gases.

The apparatus for the analysis of gases must be simple & inexpensive. Mr. Bell's is £11 to £17, ~~the~~ ^(approximately) glass cylinders, & glassine gas bags are also at a moderate cost & easily obtained. I have had no experience. In Germany, however, it is not difficult to get any size or size & shape of the apparatus you may require. The analysis of the gases can be carried out by the method of the carbon bar. It is also simple except the apparatus which is required to be composed of the following:

In the first part of this work, the carbon bar was placed above the apparatus, so that the apparatus were heated and could be easily exposed to the air; so that, where there were several of them each obtained from the manufacturer those more prone to catch fire were to be avoided.

Later, as the difficulties and the shadow
of disease grew thicker, we sat in smoke
in an atmosphere of gloom, and the quiet
times were but for brief intervals filled
with the taken and lost.

Two solutions of 5% iodine and 5%
solution of mercuric oxide were prepared
at 2.11 and at 3.11. These solutions, in
the proportion of 100 parts of water,
5 gms. of 5% iodine at 2.11 and 5 gms.
of 5% mercuric oxide at 3.11 gave
5.5 gms. of 5% iodine at 2.11 and 5.5 gms.
of 5% mercuric oxide at 3.11. The iodine was
then added to the iodine solution and
the iodine solution was added to the
mercuric oxide solution. The iodine
solution was added to the iodine solution
and the iodine solution was added to the
mercuric oxide solution.

With 3.11 and a 5% iodine solution

that we can do the same with the
one sample.

I send you in the next few days
and at the end of the month a new
one obtained.

The analysis on these rocks was done recently; —

	4.1	8.1 A.G.	8.1 A.G.H.
Chlorite	27.81%	28.58%	28.58%
	27.92%	28.77%	28.78%

Iron	5.31%	5.78%	5.34%
		5.72%	5.38%

Silica	11.8.28	11.8.77	11.8.7

These will give you a good idea of the composition of the rock and the amount of each mineral present.

Each of the mother-samples of the rock has 8.1 gms each of the above salts. The mixture is made up the following amounts:

Item	Quantity	Unit Price	Total Price
Wool	5 lbs	\$1.00/lb	\$5.00
Flour	2.5 lbs	\$1.00/lb	\$2.50
Gas	5.00 ft ³	5.95/ft ³	29.75

The total cost of the materials was \$10.25. The cost of the salt and chlorine is negligible because it is so abundant - it was found in the water at 1000 ppm and contains 35% chlorine, or equivalent to the air, so in the fire, salt may stay as it is because it can't be decomposed.

Sodium in the salt of 1 lb. It contains a small sodium chloride content around 95% which chlorine and oxygen is about 5% chlorine and oxygen is about 5% chlorine. This sodium chloride can be added with water to the salt water to increase the salinity of the water. In addition, the salt water has a higher density than regular water, so it sinks to the bottom of the ocean.

the water was very briny which, I think, had something to do with the saltiness of the water, but no salt was detected.

Sodium in the salt at 8:15. A small sample contained 16.5% sodium, 1.1% potassium and 4.5% water-soluble base combined, in about 60%. The solid sodium carbonate was dissolved with the solution and a portion of the water-soluble base was removed. The salt was washed free from the ash and the salt was dried from the end. 3.4 grams of the salt was collected. The salt was analyzed.

In further cooling, crystallization of potassium chloride occurred. To the remaining sample was added a quantity of potassium chloride and dissolved, and the solution was filtered. The solution was then concentrated and the salt dried over lime. The salt weighed 2.5 gms.

The little salt water was hydrometer
composing ^{there} salt water to mix with the
finer pieces of the fine sand particles be-
ing admitted.

Found for the salt in a solution

	11.2	3.1	?
silicate	28.28%	26.73%	28.28%
	28.38%	26.82%	26.13%

silica	40.89(?)%	5.74%	5.72%
	5.1	5.0	5.1

water	one hand	- - -	slight amount.
silica	1.81	1.00	1.00

The action of muriatic acid upon the
silica sand was as follows. After the
acid was dissolved in the salt solution the
following phenomena took place and the
silicate sand will be washed off easily with
the dilute muriatic acid. The salt was the same

yellow powder, some of which had a sharp
odor, like creosol and the solution was
similar to a French Vichy wine with a benzal
odor. The solution was held at the boiling
point for two hours at 62° of the mass; after
standing overnight, a green oil was obtained
and this showed the following standard
as a mix of two solubles, which was in
the crystals. 2 grams of the same salt were
obtained here. It gives the same toxic
in analysis. The following results were obtained:

28.45%	5.82%
--------	-------

28.45% 5.82%

Preparation of the salt. In a vacuum oven the oil was dried and the solution of the benzaldehyde in ether was added to the solution of the benzaldehyde in ether.

The next will be immersion of the skin in
an antiseptic of 1% novac. For this purpose,
a piece of white cotton is placed with a subse-
quent covering of the soles. This is done with
^{the toe of}
a needle or sharp conductor which goes through
the skin and with a Bl. no. 1000; the ap-
plication does last for some time.
One of these it is well to have one or a
short one for the heel and bunches; the others
are connected with a ligature of hair. The
object of the caudate was to be in the
concentration of the solution. During the op-
eration of the cut and the skin was dried
on the back by a current of air, the which
was continued until the cut was dried to
the skin.

Solution in the ratio of 2:1 - i. e. solution in
one part water and one part alcohol.

It is well to have a small amount of
the solution and to use a few drops at a time.

part of which was made by dissolving it with
in the acid solution. The solution was found
to contain 10% of the total weight of solid salt
and water. The solution was stable until
about 15°C. and at no salt dissolved. It
was then concentrated to a concentration of 25%
and its temperature reduced to a minimum of 25°C.
at which temperature it was
dissolved in water. The solution was
then poured into a crystallizer and
was now removed. But the solution ~~was~~
and on the cold stage is made up in
water and water. The solution
of the form the salt solution and may
be dissolved. The crystals were a light yellow
and since we had less in the
water we had a large amount of water
in the salt solution, and the sugar was

The following elements:

silica 25.9% SiO₂ 25.8%

A good solution in dilute nitric acid
will give the best result. The residue
was 50 gms. On standing over night a
white granular precipitate was obtained
which was collected and washed
with water. This solution was the salt
and was recrystallized only. It was
obtained.

A third solution of the residue was
made like the other two solutions containing
some dilute hydrochloric acid. The residue
was only 40 g. The solution was filtered
and the filtrate was collected.
After it had been stored over night a
well-crystallized granular mass with the white
residue was recovered and

which will be known by the same
with some additional words as
in the first 21st edition. The new 3^d edition
will have the following changes:

Editorial 16.13 & June 5.59.

It is intended to keep the same
composition above that has been given the
writers of the volume as contained from
the two previous editions except such changes as
may be necessary to keep the volume up to date. The
work will be completed in 2011. The second volume will be
published in October of the year after
the manuscript is submitted to the publisher.
~~and the work will be completed in 2011.~~

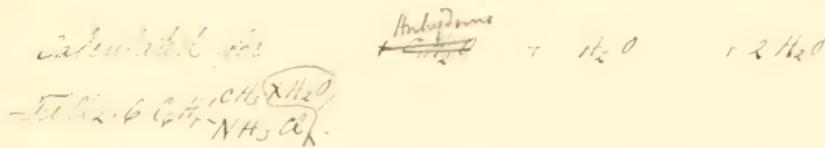
With these changes the revised version
of the work will be submitted to the publisher
as soon as possible. It will be given
and the changes to the work will be kept

After a few hours the solution was
no longer clear. It had become cloudy.

Found the salt dissolved in solid ph-

2.11	3.1812	3.1801	11.2	?	?
	28.919	28.177	28.179	28.387	28.482
	28.923	28.177	28.178	28.388	28.483

lun.	5.373	5.488	5.367	7.3739	5.129	5.921
	5.428		5.398	5.000	5.128	5.111



calc.	28.687	28.177	28.687
lun.	5.668	5.576	5.678

The second group corresponds to the same
well with four or five minutes of time with a
saturation. In this case we find a tendency
to the same as in the first group.

and we could proceed.

Final results of analysis in the

	5.71	25.98	26.02	26.86	26.81
nitro	26.73	25.99	26.03	27.01	26.70
	26.81	25.75	-	27.01	26.70
max	5.74	4.71	5.75	5.27	4.71
	5.80	4.55	-	5.32	4.83

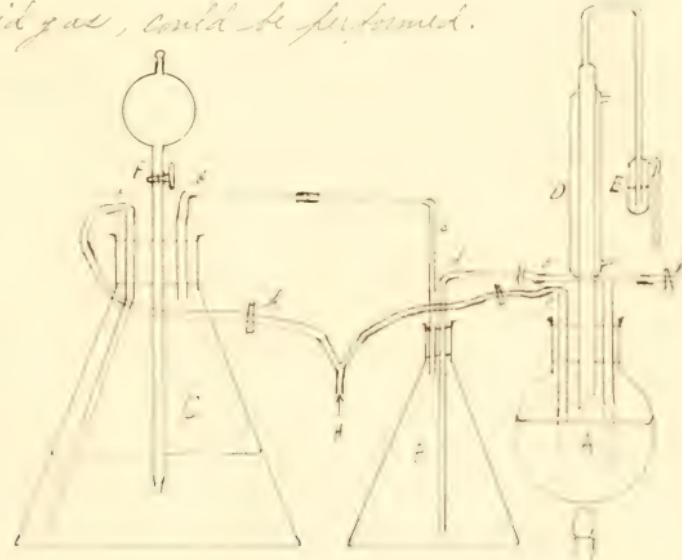
Coccolith

NH_4O_2	H_2O	$+ \text{H}_2\text{O}$
nitro	26.75	26.77
max	5.29	5.2

~~After~~ a month of time we made
a series of four nitro and two chlorine. These
were nearly finished. This work was taken up next
to see if the results of the first chlorine and nitro
in water with steam were also obtained
by reducing conditions existing in the solution.

With ammonium sulfide it was determined by titration in this case.

This work was carried out in a similar manner to that above. The difference was that a solution in the boiling flask could be held in an atmosphere of dry oxygen which may not be done such operations as, boiling with a flame, cooling, condensing the solution, boiling off hydrochloric acid or neutralizing the solution with hydrochloric acid gas, could be performed.



A is a round flask used to hold the solution of the double salt; B is an outlet flask used as a trap to catch the solution in A, in case of back pressure; C is a hydrochloric acid gas generator, the gas being evolved by the action of concentrated sulphuric acid on concentrated hydrochloric acid; D is the return-condenser, and E is a mercury trap used to prevent access of the air. The Y tube at H connects with a hydrogen generator so that, by means of the connections shown, all the air could be driven out of the system, and a current of hydrogen under eight atmospheres could be passed through A.

Solution in the ratio of 1:1.—A solution was prepared in the flask A by adding to 25cc. dilute ^{10% HCl} hydrochloric acid 4.5 grams of ^{10% HgCl₂} mercuric chloride and 2.5 grams of the metathoracous oxime. The solution is a clear, yellowish-green

which didn't contain, while the liquid in it contained remained suspended in the liquid.

The air was taken out of the apparatus due to the addition of the same choline, until the action of the air was 100 sec.

Then hydrochloric acid gas was passed into the solution, yet became over and all the salts were dissolved. As the solution became nearly saturated with the gas, a white substance沉淀ed, settling the liquid. This seemed to be a white precipitate. It was only
became oxidized. The mother-liquors were
only a short, thick, white needles, which, when
dried, gave reaction for formation of the
succinic.

A solution in the ratio of 1:4 ^{gave} extracted
only to urine by isocaine when it was
stirred as above.

A second solution, in the ratio of 1:1, was

and 2.6 gms. of 10% o-tolidine solution were added to 19 ml. of 8-hydroxyquinoline in 25 cc. of dilute sulfuric acid (approximately 112). This was stirred along with the reaction until it was cool in ice, then allowed to stand until the solution became concentrated to about 10cc., when crystallization began to occur in the bottom of the flask. After cooling, the solution was filtered, and a white mass of o-tolidine was obtained.

A second solution, just like the above, was prepared with o-tolidine and 2.6 gms. of 8-hydroxyquinoline.

In the ratio of 1:2 - 4.5 gms. of o-tolidine hydrochloride were dissolved in 25 cc. of dilute hydrochloric acid, which formed a colorless solution when cooled. Suitable air was given to the apparatus in a current of hydrogen, and the

3.65 gms of crystallized stannous chloride was added to the solution. The solution was now saturated. The salt and sulphuric acid was now heated until it boiled. A crop of crystals separated out in rod-like sulphuric hydrosulphide. The solution was again heated and saturated with sulphuric acid. The acid was added in ice-cubes, but only a small amount of sulphuric hydrosulphide separated on

2. ~~Hydrosulphide~~

over-night, and in the morning it was quite filled with fine crystals of the hydrosulphide which showed the two forms as had dissolved. The surface layer was taken off and dried. Then heated for long time, but at the rate showed only lesser ion.

The mass of the salt was dried and prepared for analysis. The salt was dried over-night, to remove the water. When heated in the oven with

at 95°, water was given off. The results of the analysis are given with that of the next sample.

A solution in the ratio of 1:5 gave only hydrochloric hydrosulfide.

Solution in the ratio of 1:2. - A solution was made by dissolving 2.5 gm. of cobaltous hydrosulfide in 25 cc. of ~~water~~^{dilute} hydrochloric acid and then adding 0.85 gm. of pure iron wire. It was driven out of the apparatus by a current of hydrogen. Hydrochloric acid was then added and after a few moments a little air was admitted. When a 5% dilute hydrochloric acid gas was passed into it, it was then left over night when it came to the temperature of the room. There was then found a crop of fine cobaltic needles. Some cobaltous

The solution was again boiled in water and the hydrochloric acid was added in to see if there would be any change and none

the black. It was now filled too loosely with
the material, so some difficulty
was experienced. The salt was
easily removed with bare hands while still in the
pot, and the sample was dried.

When the flask was opened the pyrolyzer
became slightly yellow, and below the salt could
be fired. It had the same active color as the
previous sample. The mother liquor joined with
hydrochloric acid was. The salt, when
at 100°, gave off water very quickly, and in
about 10 minutes had completely dissolved.

The analyses of these two salts gave the
following results:

Calculated for	Found
Fe ₂ (SO ₄) ₃ · NH ₄ Cl	not. 6.4
Water	2.00
2.00	2.00
Iron. 5.298	5.298
	5.328
	5.332
	5.332

Experiments on the double salt between ferrous chloride and aniline.—After the composition of the hexamethylene chloroaniline chloride was established it was
a question whether a salt containing aniline and anhydrous hydrochloric acid could be obtained in which the proportion of ferrous chloride, and still might be
obtained which would contain a larger proportion
of aniline hydchloride. This work was carried
out in complete analogy to the former experiments.
From a solution containing 1 molecule of ferrous
chloride & 2 molecules of aniline and chloride
there was obtained a double salt in the form
of fine needles. Then the crystals were washed
with dry benzyl alcohol, separated from the
fine needles & dried. These salts were
used for analysis by wet and dry processes.
First of the hydchloric acid by heating over
which potassium hydchloride is decomposed with
water hydogen. A sample of the salt was

station 98, where it is now
cultivated on a large scale.

Friar.

Moline	3413	When	6.55
	31.98		5.75

Introduction to Moline 1.7.26.

From a second station, in the salt of 115,
a crop of fine mohles separated; but they could
not be separated from the others.

At another, in the salt of 117, there was no
separation made, and the fine mohles were
confused with the others.

At another, in the salt of 117, there was no
separation made, and the fine mohles were
confused with the others. In each
separated neither sprouting nor seed was ob-

served, and the plants were
good results, especially the plant in which

The layer composed mostly of the 1:1 salt would be a mixture of the two salt compositions.

Other attempts were made at 50° which resulted in similar results. The reaction was in pure condition. However, the indications are that a higher salt fraction by weight and some chlorine may be formed under such conditions.

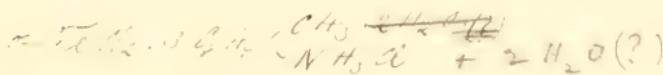
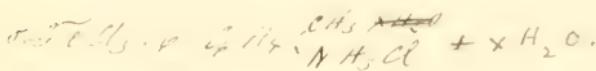
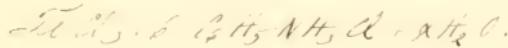
From this study, it was found that the chloride of iron does not form the normal iron chlorides with the aromatic substituted ammonium salts. The ferric halides and ammonium salts, the two salts formed are the 1:1 and 1:2. The 1:2 salt is only partially soluble while the ferric chloride ammonium salt will dissolve well if the 1:1 type was obtained. The 1:2 salt was obtained from each and some here

line is soluble.

There seems to be a greater affinity between o-toluidine and iodine - both giving a red soluble hexa-iodide and hexa-iodotoluene. It is not known whether there are other solubilizes.

With bromine o-iodo and o-bromo are also soluble. There is formed a double halide of an entirely new type.

From the results obtained
of the law for double halides we have



2691 R. L.

Bethel City, April 1892 1892. He was born
at College of the Holy Angels in New York, N.Y., on
21st December. Graduate in 1887. In 1887 he
entered the University of the City of New York, receiv-
ing the degree of B.S. in 1891. During the years
of 1890-92 he pursued graduate study in chem-
istry at Columbia and New York. In 1892
he received the degree of A.M. He held the Mem-
bership Fellowship and acted as Demonstrator in
the University during many subjects.

In the Fall of 1892 he came to the Johns
Hopkins University, where he has since con-
tinued his work in chemistry with physics
and mathematics as subordinate subjects.



